



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:28 PM UTC

PDB ID : 4CI1 / pdb_00004ci1
Title : Structure of the DDB1-CRBN E3 ubiquitin ligase bound to thalidomide
Authors : Fischer, E.S.; Boehm, K.; Thoma, N.H.
Deposited on : 2013-12-05
Resolution : 2.98 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

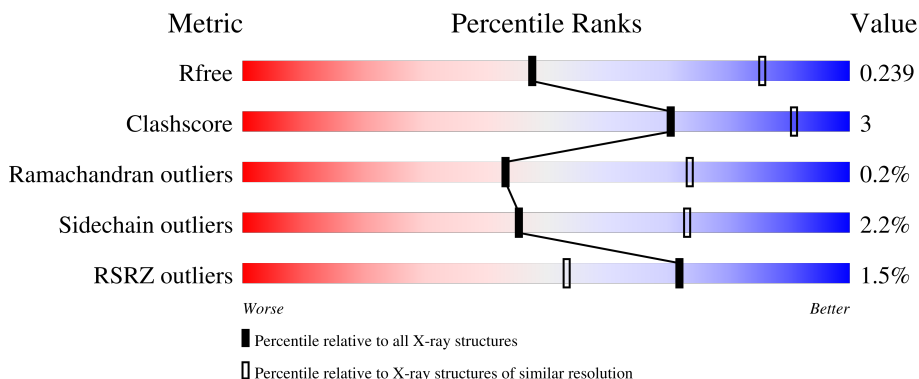
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.98 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3580 (3.00-2.96)
Clashscore	190562	3904 (3.00-2.96)
Ramachandran outliers	187476	3761 (3.00-2.96)
Sidechain outliers	187428	3764 (3.00-2.96)
RSRZ outliers	180081	3579 (3.00-2.96)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	1158	% 84% 10% • 6%
2	B	469	% 67% 12% • 21%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11460 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called DNA DAMAGE-BINDING PROTEIN 1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	As	C	N	O	S			
1	A	1091	8420	2	5352	1412	1609	45	0	0	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-17	MET	-	expression tag	UNP Q16531
A	-16	HIS	-	expression tag	UNP Q16531
A	-15	HIS	-	expression tag	UNP Q16531
A	-14	HIS	-	expression tag	UNP Q16531
A	-13	HIS	-	expression tag	UNP Q16531
A	-12	HIS	-	expression tag	UNP Q16531
A	-11	HIS	-	expression tag	UNP Q16531
A	-10	ARG	-	expression tag	UNP Q16531
A	-9	ARG	-	expression tag	UNP Q16531
A	-8	LEU	-	expression tag	UNP Q16531
A	-7	VAL	-	expression tag	UNP Q16531
A	-6	PRO	-	expression tag	UNP Q16531
A	-5	ARG	-	expression tag	UNP Q16531
A	-4	GLY	-	expression tag	UNP Q16531
A	-3	SER	-	expression tag	UNP Q16531
A	-2	GLY	-	expression tag	UNP Q16531
A	-1	GLY	-	expression tag	UNP Q16531
A	0	ARG	-	expression tag	UNP Q16531

- Molecule 2 is a protein called PROTEIN CEREBLON.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	As	C	N	O	S			
2	B	370	2985	2	1895	522	544	22	0	0	0

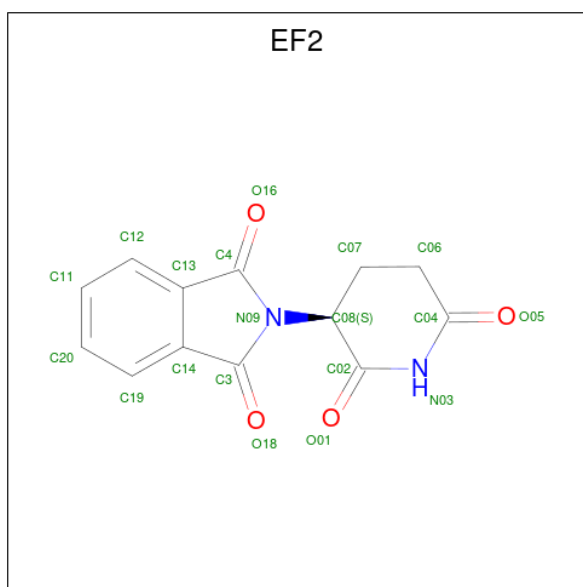
There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-23	MET	-	expression tag	UNP P0CF65
B	-22	ASP	-	expression tag	UNP P0CF65
B	-21	TRP	-	expression tag	UNP P0CF65
B	-20	SER	-	expression tag	UNP P0CF65
B	-19	HIS	-	expression tag	UNP P0CF65
B	-18	PRO	-	expression tag	UNP P0CF65
B	-17	GLN	-	expression tag	UNP P0CF65
B	-16	PHE	-	expression tag	UNP P0CF65
B	-15	GLU	-	expression tag	UNP P0CF65
B	-14	LYS	-	expression tag	UNP P0CF65
B	-13	SER	-	expression tag	UNP P0CF65
B	-12	ALA	-	expression tag	UNP P0CF65
B	-11	VAL	-	expression tag	UNP P0CF65
B	-10	ASP	-	expression tag	UNP P0CF65
B	-9	GLU	-	expression tag	UNP P0CF65
B	-8	ASN	-	expression tag	UNP P0CF65
B	-7	LEU	-	expression tag	UNP P0CF65
B	-6	TYR	-	expression tag	UNP P0CF65
B	-5	PHE	-	expression tag	UNP P0CF65
B	-4	GLN	-	expression tag	UNP P0CF65
B	-3	GLY	-	expression tag	UNP P0CF65
B	-2	GLY	-	expression tag	UNP P0CF65
B	-1	GLY	-	expression tag	UNP P0CF65
B	0	ARG	-	expression tag	UNP P0CF65

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total Zn 1 1	0	0

- Molecule 4 is S-Thalidomide (CCD ID: EF2) (formula: C₁₃H₁₀N₂O₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total	C	N	O	0	0
			19	13	2	4		

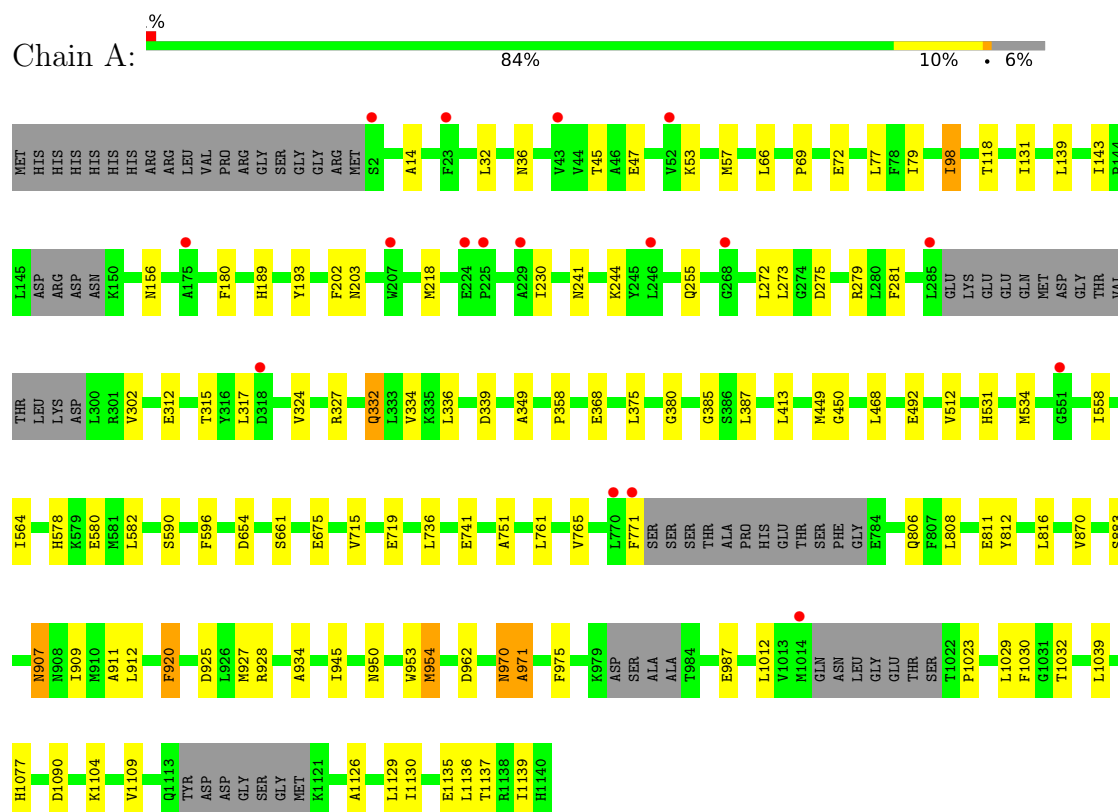
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	22	Total	O	0	0
			22	22		
5	B	13	Total	O	0	0
			13	13		

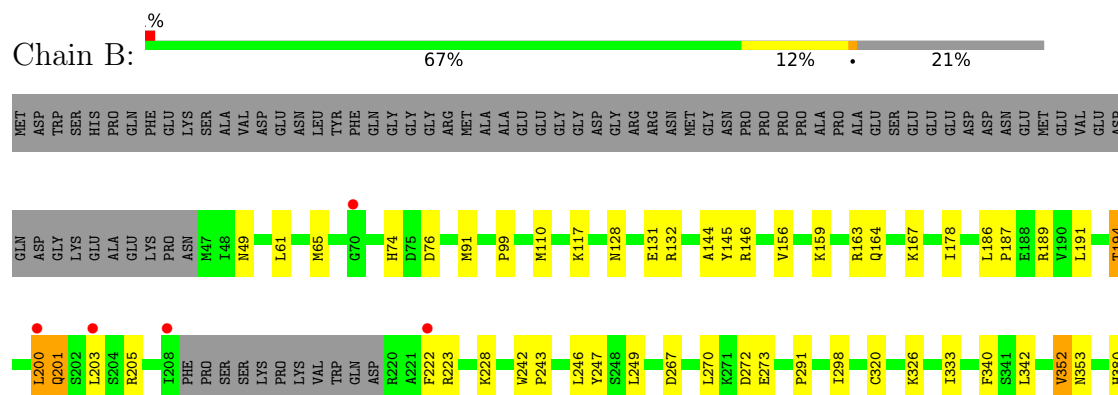
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: DNA DAMAGE-BINDING PROTEIN 1



• Molecule 2: PROTEIN CEREBLON



W388	M400	F404	K408	L425	P426	R427	ILE	PRO	GLU	ALA	GLU	ASP	GLU	LEU	GLY	HIS	ASP	ARG	SER	PRO	LEU	LEU	CYS	LEU
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4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	172.18Å 172.18Å 140.09Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.82 – 2.98 29.82 – 2.98	Depositor EDS
% Data completeness (in resolution range)	100.0 (29.82-2.98) 99.8 (29.82-2.98)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 3.00Å)	Xtriage
Refinement program	BUSTER 2.11.4	Depositor
R, R_{free}	0.197 , 0.233 0.205 , 0.239	Depositor DCC
R_{free} test set	2461 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	78.9	Xtriage
Anisotropy	0.085	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 86.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.020 for -h,-k,l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	11460	wwPDB-VP
Average B, all atoms (Å ²)	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.62% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CAF, ZN, EF2

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.75	1/8553 (0.0%)	1.20	14/11605 (0.1%)
2	B	0.75	0/3037	1.28	13/4119 (0.3%)
All	All	0.75	1/11590 (0.0%)	1.22	27/15724 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	954	MET	SD-CE	-5.16	1.66	1.79

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	117	LYS	CA-C-N	8.30	131.76	120.38
2	B	117	LYS	C-N-CA	8.30	131.76	120.38
1	A	920	PHE	CA-CB-CG	7.96	121.76	113.80
1	A	925	ASP	CA-CB-CG	6.67	119.27	112.60
2	B	201	GLN	N-CA-C	6.05	116.08	108.45
2	B	222	PHE	CA-CB-CG	5.92	119.72	113.80
1	A	312	GLU	N-CA-C	-5.89	104.25	112.45
1	A	275	ASP	CA-CB-CG	5.86	118.46	112.60
2	B	200	LEU	N-CA-C	-5.85	101.53	109.54
2	B	201	GLN	CA-C-N	5.81	128.54	120.29
2	B	201	GLN	C-N-CA	5.81	128.54	120.29
1	A	202	PHE	CA-CB-CG	5.76	119.56	113.80
1	A	970	ASN	CA-C-N	5.74	132.50	121.54
1	A	970	ASN	C-N-CA	5.74	132.50	121.54
1	A	1090	ASP	CA-C-N	5.59	126.29	120.03
1	A	1090	ASP	C-N-CA	5.59	126.29	120.03
1	A	332	GLN	N-CA-C	5.58	117.66	109.24
2	B	353	ASN	CA-CB-CG	5.51	118.11	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	49	ASN	CA-CB-CG	5.45	118.05	112.60
1	A	1030	PHE	CA-CB-CG	5.30	119.10	113.80
2	B	408	LYS	CA-C-N	5.10	127.63	120.28
2	B	408	LYS	C-N-CA	5.10	127.63	120.28
1	A	907	ASN	N-CA-C	5.08	119.75	113.50
2	B	228	LYS	CA-C-N	5.07	127.03	120.44
2	B	228	LYS	C-N-CA	5.07	127.03	120.44
1	A	1032	THR	CA-C-N	5.06	127.39	120.46
1	A	1032	THR	C-N-CA	5.06	127.39	120.46

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	8420	0	8287	54	0
2	B	2985	0	2916	28	0
3	B	1	0	0	0	0
4	B	19	0	10	1	0
5	A	22	0	0	0	0
5	B	13	0	0	1	0
All	All	11460	0	11213	77	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (77) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:954:MET:HE2	1:A:975:PHE:HZ	1.49	0.77
1:A:57:MET:HE1	1:A:79:ILE:HG21	1.70	0.74
1:A:255:GLN:HB2	1:A:279:ARG:HH22	1.57	0.69
1:A:954:MET:HE2	1:A:975:PHE:CZ	2.31	0.64
1:A:596:PHE:HB3	1:A:661:SER:HB2	1.79	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:110:MET:HG3	2:B:178:ILE:HG21	1.80	0.63
1:A:953:TRP:HB2	1:A:970:ASN:HB2	1.80	0.62
1:A:358:PRO:HD2	1:A:380:GLY:HA2	1.85	0.58
1:A:765:VAL:HG12	1:A:806:GLN:HB3	1.86	0.57
1:A:449:MET:HE3	1:A:450:GLY:H	1.70	0.57
1:A:928:ARG:HA	1:A:954:MET:HE3	1.86	0.57
1:A:385:GLY:HA3	1:A:719:GLU:O	2.06	0.56
1:A:934:ALA:HB2	1:A:945:ILE:HD11	1.89	0.55
1:A:273:LEU:HB2	1:A:281:PHE:HB2	1.89	0.55
4:B:1429:EF2:H19	5:B:2006:HOH:O	2.06	0.54
2:B:242:TRP:HB3	2:B:246:LEU:HD23	1.89	0.54
1:A:1109:VAL:HG12	1:A:1129:LEU:HD22	1.89	0.54
1:A:413:LEU:HD22	1:A:468:LEU:HD22	1.91	0.53
1:A:1126:ALA:O	1:A:1130:ILE:HG12	2.09	0.53
1:A:375:LEU:HB2	1:A:1012:LEU:HD21	1.91	0.53
1:A:1039:LEU:HD22	1:A:1139:ILE:HD12	1.91	0.53
1:A:14:ALA:HB1	1:A:327:ARG:HG3	1.91	0.53
1:A:492:GLU:HG3	1:A:512:VAL:HG11	1.90	0.52
2:B:326:LYS:HG3	2:B:425:LEU:HD13	1.92	0.52
2:B:65:MET:HG2	2:B:146:ARG:HB2	1.90	0.52
2:B:333:ILE:HG12	2:B:400:MET:HE2	1.93	0.51
1:A:32:LEU:HD13	1:A:66:LEU:HD11	1.93	0.51
1:A:654:ASP:HA	1:A:675:GLU:HG3	1.92	0.50
2:B:201:GLN:HE21	2:B:203:LEU:HB2	1.77	0.50
2:B:74:HIS:HB2	2:B:164:GLN:HE22	1.77	0.50
1:A:131:ILE:HB	1:A:143:ILE:HB	1.93	0.49
2:B:144:ALA:HB3	2:B:159:LYS:HB2	1.94	0.49
1:A:53:LYS:HD3	1:A:98:ILE:HD13	1.93	0.49
2:B:145:TYR:CE1	2:B:156:VAL:HG21	2.47	0.49
1:A:578:HIS:NE2	1:A:580:GLU:HG2	2.28	0.49
1:A:449:MET:HE3	1:A:450:GLY:N	2.28	0.48
1:A:139:LEU:HD22	1:A:156:ASN:HB3	1.96	0.48
1:A:69:PRO:HD2	1:A:72:GLU:HG3	1.95	0.48
2:B:91:MET:HE1	2:B:298:ILE:HG13	1.95	0.47
1:A:1136:LEU:O	1:A:1139:ILE:HG12	2.15	0.47
1:A:218:MET:HE2	2:B:205:ARG:HH12	1.80	0.47
1:A:241:ASN:HB3	1:A:244:LYS:HB3	1.98	0.46
2:B:267:ASP:HB3	2:B:270:LEU:HB2	1.99	0.45
1:A:927:MET:HE3	2:B:191:LEU:HD12	1.99	0.45
1:A:358:PRO:HD2	1:A:380:GLY:CA	2.45	0.45
1:A:883:SER:HB2	1:A:911:ALA:HB3	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:246:LEU:HD12	2:B:249:LEU:HD12	1.99	0.45
1:A:736:LEU:HG	1:A:816:LEU:HD22	1.99	0.45
1:A:45:THR:C	1:A:47:GLU:H	2.25	0.45
1:A:77:LEU:HD21	1:A:79:ILE:HD11	1.97	0.44
1:A:564:ILE:HG22	1:A:582:LEU:HB2	2.00	0.44
1:A:971:ALA:HB3	1:A:1077:HIS:O	2.18	0.44
1:A:907:ASN:C	1:A:909:ILE:H	2.25	0.44
2:B:76:ASP:HB3	2:B:187:PRO:HG3	2.00	0.44
1:A:812:TYR:CZ	2:B:243:PRO:HB3	2.53	0.44
1:A:1023:PRO:HG3	1:A:1135:GLU:CG	2.48	0.43
1:A:808:LEU:HB2	1:A:811:GLU:HB2	1.99	0.42
1:A:741:GLU:HG2	1:A:751:ALA:HA	2.00	0.42
2:B:167:LYS:HB2	2:B:186:LEU:HD21	2.00	0.42
1:A:870:VAL:HA	1:A:883:SER:O	2.20	0.42
2:B:388:TRP:HB3	2:B:404:PHE:CE2	2.54	0.42
1:A:334:VAL:HG12	1:A:349:ALA:HA	2.01	0.42
1:A:950:ASN:HB3	2:B:189:ARG:HH12	1.84	0.42
1:A:387:LEU:HB2	1:A:715:VAL:HB	2.01	0.42
1:A:118:THR:HG22	2:B:205:ARG:HA	2.01	0.41
2:B:267:ASP:HB3	2:B:270:LEU:HD12	2.01	0.41
2:B:352:VAL:O	2:B:380:HIS:HE1	2.04	0.41
1:A:534:MET:HE2	1:A:558:ILE:HD13	2.02	0.41
2:B:340:PHE:HE2	2:B:342:LEU:HD13	1.85	0.41
1:A:272:LEU:HD21	1:A:336:LEU:HD11	2.01	0.41
2:B:99:PRO:HB2	2:B:352:VAL:HG22	2.03	0.41
2:B:128:ASN:ND2	2:B:131:GLU:HB2	2.35	0.41
2:B:194:THR:HG21	2:B:247:TYR:HD1	1.86	0.41
1:A:180:PHE:HE1	1:A:193:TYR:HD2	1.70	0.40
1:A:324:VAL:HB	1:A:332:GLN:HB2	2.03	0.40
1:A:912:LEU:HD21	2:B:246:LEU:HD11	2.03	0.40
2:B:291:PRO:HG2	2:B:320:CAF:O1	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	1075/1158 (93%)	1011 (94%)	61 (6%)	3 (0%)	36	67
2	B	364/469 (78%)	348 (96%)	16 (4%)	0	100	100
All	All	1439/1627 (88%)	1359 (94%)	77 (5%)	3 (0%)	43	73

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	ASN
1	A	368	GLU
1	A	971	ALA

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	921/1012 (91%)	903 (98%)	18 (2%)	48	75
2	B	324/414 (78%)	314 (97%)	10 (3%)	35	66
All	All	1245/1426 (87%)	1217 (98%)	28 (2%)	45	73

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	ILE
1	A	189	HIS
1	A	203	ASN
1	A	230	ILE
1	A	302	VAL
1	A	315	THR
1	A	317	LEU
1	A	339	ASP
1	A	531	HIS
1	A	590	SER

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Mol	Chain	Res	Type
1	A	761	LEU
1	A	771	PHE
1	A	920	PHE
1	A	962	ASP
1	A	987	GLU
1	A	1029	LEU
1	A	1104	LYS
1	A	1137	THR
2	B	61	LEU
2	B	132	ARG
2	B	163	ARG
2	B	194	THR
2	B	200	LEU
2	B	223	ARG
2	B	272	ASP
2	B	273	GLU
2	B	352	VAL
2	B	389	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	4	ASN
1	A	16	ASN
1	A	241	ASN
1	A	261	HIS
1	A	355	ASN
1	A	465	HIS
1	A	481	GLN
1	A	670	ASN
1	A	708	GLN
1	A	797	HIS
1	A	877	ASN
1	A	941	ASN
1	A	964	ASN
1	A	999	HIS
1	A	1034	ASN
1	A	1059	ASN
2	B	104	HIS
2	B	128	ASN
2	B	179	GLN
2	B	201	GLN

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Mol	Chain	Res	Type
2	B	299	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	CAF	B	312	2	5,9,10	0.50	0	4,12,14	1.21	0
1	CAF	A	87	1	5,9,10	0.59	0	4,12,14	1.26	0
1	CAF	A	977	1	5,9,10	0.52	0	4,12,14	0.96	0
2	CAF	B	320	2	5,9,10	0.61	0	4,12,14	1.40	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	CAF	B	312	2	-	0/0/8/10	-
1	CAF	A	87	1	-	0/0/8/10	-
1	CAF	A	977	1	-	0/0/8/10	-
2	CAF	B	320	2	-	0/0/8/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	320	CAF	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	EF2	B	1429	-	21,21,21	1.15	2 (9%)	31,31,31	1.96	11 (35%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EF2	B	1429	-	-	0/4/33/33	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1429	EF2	C13-C4	2.10	1.52	1.48
4	B	1429	EF2	C3-N09	-2.06	1.36	1.40

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1429	EF2	C06-C04-N03	3.89	120.82	116.69
4	B	1429	EF2	C14-C3-N09	3.67	110.02	105.96
4	B	1429	EF2	C02-C08-N09	3.40	112.11	109.08
4	B	1429	EF2	C13-C14-C3	-3.36	105.31	108.26
4	B	1429	EF2	O16-C4-C13	-2.99	122.87	128.66
4	B	1429	EF2	O18-C3-C14	-2.94	122.96	128.66
4	B	1429	EF2	C13-C4-N09	2.61	108.84	105.96
4	B	1429	EF2	C14-C13-C4	-2.43	106.13	108.26
4	B	1429	EF2	O16-C4-N09	2.33	128.27	124.99
4	B	1429	EF2	C19-C14-C3	2.13	133.17	129.59
4	B	1429	EF2	C07-C06-C04	-2.09	109.54	113.87

There are no chirality outliers.

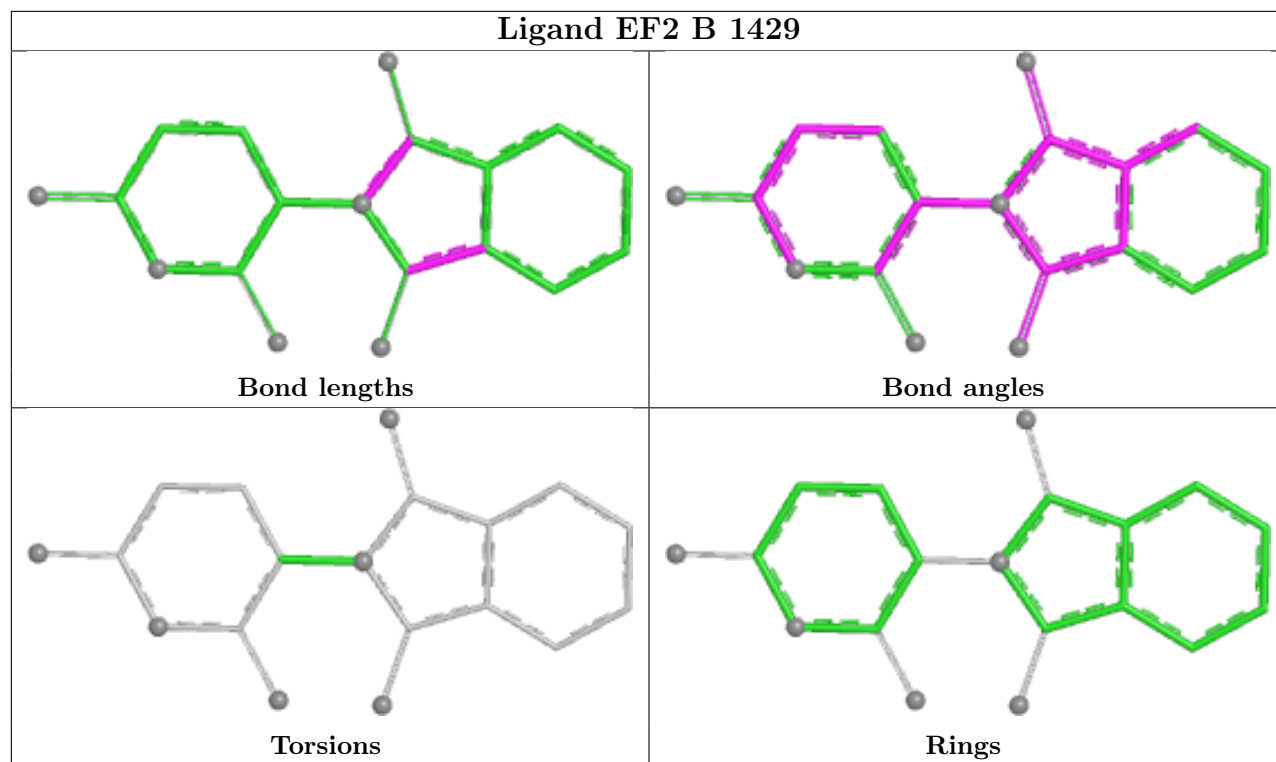
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1429	EF2	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2		OWAB(Å ²)	Q<0.9
1	A	1089/1158 (94%)	0.19	17 (1%)	70 51	48, 91, 131, 156	0
2	B	368/469 (78%)	-0.18	5 (1%)	73 55	40, 65, 111, 140	0
All	All	1457/1627 (89%)	0.10	22 (1%)	72 53	40, 86, 128, 156	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	208	ILE	5.1
2	B	200	LEU	3.8
2	B	222	PHE	3.4
1	A	285	LEU	3.0
1	A	1014	MET	2.8
1	A	771	PHE	2.7
1	A	224	GLU	2.6
1	A	551	GLY	2.5
1	A	318	ASP	2.5
1	A	246	LEU	2.4
1	A	770	LEU	2.4
1	A	225	PRO	2.4
1	A	52	VAL	2.3
1	A	2	SER	2.3
2	B	203	LEU	2.2
1	A	23	PHE	2.2
1	A	229	ALA	2.1
1	A	268	GLY	2.1
2	B	70	GLY	2.1
1	A	43	VAL	2.1
1	A	207	TRP	2.1
1	A	175	ALA	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
1	CAF	A	87	10/11	0.94	0.12	81,84,86,87	4
2	CAF	B	312	10/11	0.96	0.09	55,62,67,68	4
1	CAF	A	977	10/11	0.97	0.10	74,82,86,88	4
2	CAF	B	320	10/11	0.97	0.10	65,66,69,69	4

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

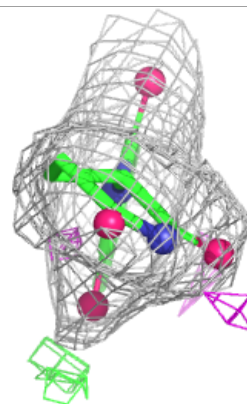
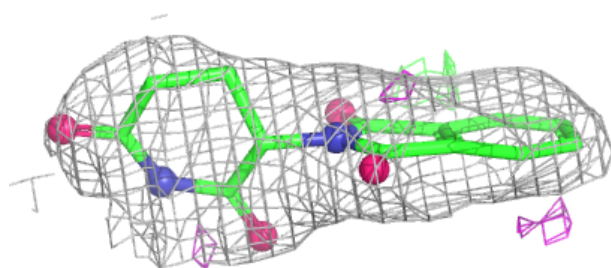
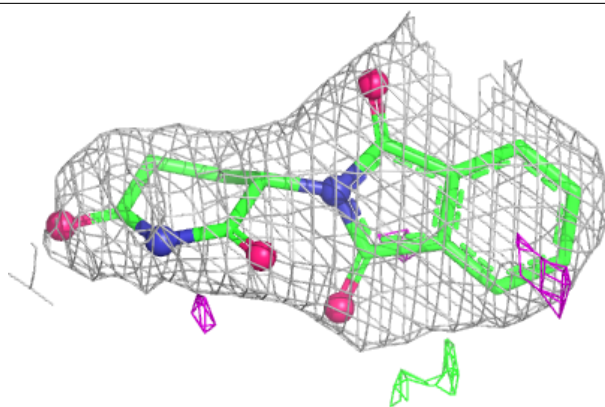
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	EF2	B	1429	19/19	0.96	0.08	45,52,60,63	0
3	ZN	B	1428	1/1	1.00	0.04	52,52,52,52	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around EF2 B 1429:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.